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ABSTRACT

This report contains the findings of the National Science Foundation (NSF) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1978. More than 79% of the 2,228 academic institutions surveyed supplied usable data for this report, including 90% of the doctorate-granting institutions where two-thirds of all academic scientists and engineers are employed. (Author)

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SCIENCE RESOURCES STUDIES HIGHLIGHTS

NATIONAL SCIENCE FOUNDATION WASHINGTON, D.C. 20550 JULY 31, 1979 NSF 79-315

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Academic Scientists and Engineers Increase 3% in 1978

This report contains the findings of the National Science Foundation (NSF) Survey of Scientific and Engineering Personnel Employed at Universities and Colleges, January 1978. More than 79 percent of the 2,228 academic institutions surveyed supplied usable data for this report, including 90 percent of the doctorate-granting institutions where two-thirds of all academic scientists and engineers are employed. Estimates by NSF staff for nonrespondent institutions accounted for 12 percent of the total academic scientists and engineers.

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Highlights

- Scientists and engineers employed at U.S. universities and colleges totaled more than 306,000 in 1978, representing a 3-percent increase over 1977. Although a 2-percent rise in full-time scientists and engineers accounted for most of the absolute increase, those employed on a part-time basis rose at a more rapid rate (7 percent). There is some evidence that many of these "new hires" are outside the tenure track in higher education. A recent study concluded that large research-oriented universities are expanding their utilization of nonfaculty research personnel, with the majority of these professionals being in the physical and biological sciences.[1] In support of this finding, the current survey data for full-time professional employment show an increase of 5 percent in full-time-equivalant (FTE) involvement in R&D activities compared with only 1 percent in teaching.
- The 1977-78 augmentation of the academic science and engineering (S/E) labor force took place entirely in institutions offering graduate degrees. This may signify the end of a decade of expanding S/E employment in 2-year junior and community colleges. During 1969-75, student enrollment in junior and community colleges grew rapidly and S/E employment responded by almost doubling. By 1975, however, both enrollment and S/E employment had begun to level off in 2-year institutions.
- The growth rate for women employed full time at universities and colleges exceeded the increase for men in all S/E fields between 1977 and 1978. Women's relative share of the S/E total, however, remains nominal in all major disciplines shown in this report. Even so, academe compares favorably to other U.S. economic sectors, with women accounting for 16 percent of total full-time S/E employment, while averaging 8 percent nationally.[2]
- Increases in total S/E employment were spread across all major disciplines in 1978. The expansion in employment in the life sciences was the largest both in relative (4 percent) and absolute terms, accounting for a major part of the overall S/E personnel change. This represents a significant change from the 1973-77 period during which the rate of growth in employment among life sciences fell behind all other disciplines. Most of the employment increases between 1977 and 1978 in the life sciences were centered in large universities with medical schools.
- Since 1973 publicly controlled institutions have employed 7 of every 10 academic scientists and engineers. In 1978, however, for the first time since 1973, the relative growth of the S/E population at private schools exceeded substantially that of publicly controlled institutions. According to the most recent data, private institutions have experienced a similar margin over public institutions in the rate of growth in the number of graduate science students. Between 1976 and 1977, graduate enrollments at private institutions grew at almost three times the rate for public institutions.[3]

[1] National Research Council, Commission on Human Resources, *Nonfaculty Doctoral Research Staff in Science and Engineering in United States Universities* (Washington, D.C.: National Academy of Sciences, 1978.)

[2] National Science Foundation, *Detailed Statistical Tables, U.S. Scientists and Engineers, 1976* (NSF 79-305) (Washington, D.C., 1979.)

[3] National Science Foundation, *Detailed Statistical Tables, Graduate Science Education: Student Support and Postdoctorals, Fall 1977* (NSF 78-315) (Washington, D.C., 1978.)

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Prepared in the Universities and Nonprofit Institutions Studies Group, Division of Science Resources Studies

Employment Status

The growth rate among full-time academic scientists and engineers between 1977 and 1978 (2 percent) was exceeded by that for part-timers (7 percent) for the fifth consecutive year (table 1). The percentage of total academic scientists and engineers made up of part-timers, however, has changed little over this period, increasing from 18 percent in 1973 to 21 percent in 1978. Master's institutions which account for 13 percent of total S/E employment, are responsible for about one-half the increase in part-time employment.

S/E employment totals declined in 1978 at institutions where the bachelor's degree is the highest S/E certificate awarded. In fact, the total number of scientists and engineers at these schools in 1978 was below 1973 levels, although there has been a slight increase in the utilization of part-time personnel during the last five years. Part of this decrease can be traced to a number of institutions shifting from undergraduate to graduate-degree status.

Type of Activity

Measured in FTE terms, more than 70 percent of the academic S/E force was engaged in teaching in 1978, a level that was roughly equivalent to that reported in 1973. FTE's engaged in R&D-related activities (i.e., separately budgeted research) represented 21 percent in 1978, again reflecting little change from 1973 levels.

Universities which grant a doctorate in the sciences or engineering account for 97 percent of all R&D-engaged FTE's; this is not surprising, however, since more than 98 percent of all academic R&D spending takes place at these schools. The teaching portion of the FTE total is relatively lower, 61 percent, at doctorate institutions.

As seen in the accompanying chart, the employment status also has a direct impact on whether FTE-measured scientists and engineers tend to be in teaching or R&D activities (chart 1). In 1978 full-timers accounted for nine-tenths of the FTE R&D total.

FTE's devoted to R&D activities as a percent of total FTE's ranged from 29 percent in the life sciences to 9 percent in mathematics in 1978.

Field of Employment

Total S/E employment increased in each of the seven major disciplines between 1977 and 1978. Because of increases occurring primarily among biologists and medical scientists, life scientists—who represent two-fifths of all academic scientists and engineers—grew at the fastest rate, more than 4 percent. Full- and part-time S/E personnel growth took place in all of the major fields except psychology where part-timers declined.

Since 1973 universities and colleges have expanded employment in all fields, with the fastest relative growth occurring in the environmental sciences and the largest absolute increase occurring among the life sciences. Life scientists, despite their 1978 growth, have increased along with physical scientists at the slowest relative rate since 1973, averaging less than 2 percent per year (chart 2).

Table 1. Characteristics of scientists and engineers employed at universities and colleges: January 1978

[Numbers in thousands]

Item	Total	Percent change 1977-78	Full-time	Percent change 1977-78
Total	308.5	3	241.1	2
By type of activity:				
(measured in FTE[1] terms)				
Teaching	191.3	2	170.5	1
Research and development	57.1	5	53.6	5
Other activities	17.8	6	17.1	6
By major field of employment:				
Engineers	30.9	3	24.6	3
Physical scientists	32.8	2	27.9	1
Environmental scientists	9.4	2	8.1	2
Mathematical and computer scientists	32.9	3	24.3	2
Life scientists	122.5	4	97.2	3
Psychologists	23.7	(2)	17.4	(2)
Social scientists	54.2	2	41.6	1
By institutional control:				
Public	209.9	2	168.4	1
Private	96.7	5	72.7	4
By highest degree granted in science and engineering:				
Doctorate institutions	198.9	3	163.7	3
Master's institutions	39.2	13	29.6	9
Bachelor's institutions	26.3	-5	21.2	-6
No S/E degree[3]	42.2	(2)	26.6	-1
By sex:				
Men	NA	—	202.4	2
Women	NA	—	38.7	5

[1] Full-time-equivalent.
[2] Less than 0.5 percent change.
[3] Consists primarily of 2-year institutions.

SOURCE: National Science Foundation.

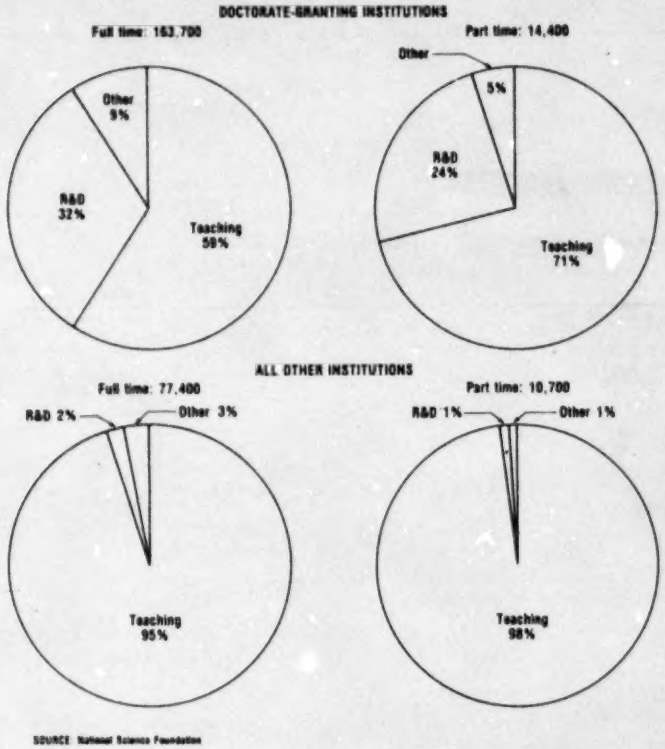
Institutional Control

Public universities and colleges accounted for nearly 69 percent of academic scientists and engineers in 1978 compared to 66 percent in 1973. While both public and private institutions increased their total number of scientists and engineers, the growth in private institutions (4 percent) during 1977-78 exceeded that of public institutions (1 percent). It occurred in a relatively small number of private doctorate-granting universities with large research programs and large S/E graduate enrollment. By contrast, between 1973 and 1977, S/E employment increases took place mainly at public institutions where the number of scientists and engineers expanded at an average rate of 4 percent per year, compared to 1 percent per year among private schools.

Sex

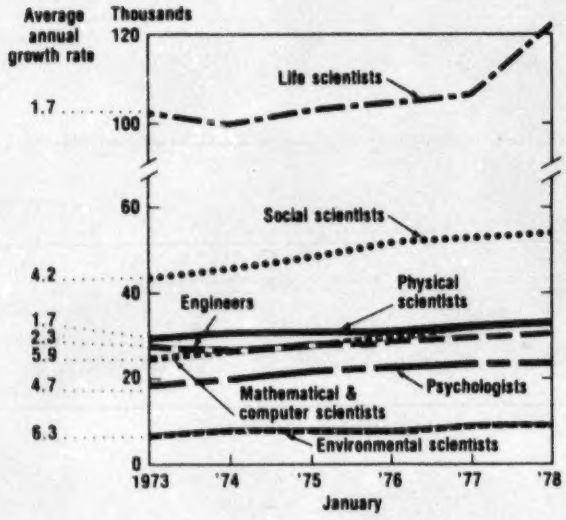
The number of women employed full time as scientists and engineers in universities and colleges increased 5 percent in 1978, more than twice the 2-percent growth rate for men. A faster growth rate of female

Chart 1. FTE scientists and engineers employed at universities and colleges by type of institution, status, and type of activity: January 1978



SOURCE: National Science Foundation

Chart 2. Scientists and engineers employed at universities and colleges by field: 1973-78



SOURCE: National Science Foundation

scientists and engineers occurred in the past year in all of the seven major S/E disciplines, with engineers increasing at the fastest rate, 19 percent. Only 1 of every 40 engineers employed in academia is female, however.

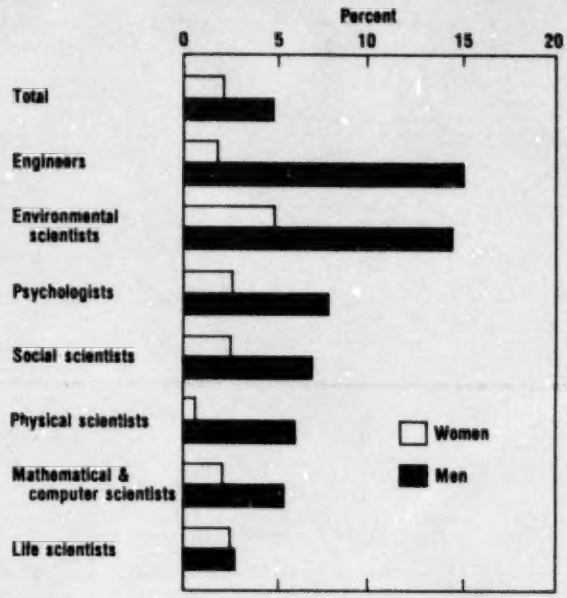
Since 1974, when sex data on full-time employment were first collected, the growth rate for women has expanded at twice that for men in six of the seven major fields, and has also outpaced men in the seventh discipline. Few of these women, however, were placed in tenure track positions, according to a recent study conducted under an NSF grant, which revealed a high concentration of women scientists and engineers holding nonacademic, nontenure research appointments (chart 3).[4]

The 20 Leading Institutions in S/E Employment

The 20 leading universities based on full-time S/E employment accounted for 18 percent of all full-time academic scientists and engineers, about the same share that was reported in 1976 and 1977. Seventeen of these

[4] Clare Rose, Sally Menniger, and Glenn Nyre. *The Study of the Academic Employment and Graduate Enrollment Patterns and Trends of Women in Science and Engineering*, conducted for NSF under grants Nos. SRS 76-82705 and SRS 77-16927. (Los Angeles, Calif.: Evaluation and Testing Institute, 1978.)

Chart 3. Average annual growth of scientists and engineers employed at universities and colleges by sex: January 1974-78



SOURCE: National Science Foundation

largest academic employers of full-time personnel are also included among the 20 leading universities ranked by either R&D spending or graduate enrollment. As a result, these 20 institutions also accounted for a substantial portion of all academic R&D spending and graduate S/E enrollment, 30 percent and 18 percent, respectively.

Harvard University was the leading employer of full-time scientists and engineers for the third consecutive year. There was only one new entrant into the top 20 in 1978, Stanford University, primarily as a result of an increase in medical scientists (table 2).

Table 2. Twenty leading universities and colleges employing full-time scientists and engineers: January 1977 and January 1978

	Institution	Full-time scientists engineers		Percent change
		1977	1978	
	Total, all institutions	235,859	241,099	2.2
	20 leading institutions	41,964	42,590	1.4
1.	Harvard Univ.	3,285	3,385	3.0
2.	Univ. of Wisconsin - Madison	3,185	2,965	-6.9
3.	Univ. of Minnesota	2,890	2,901	.4
4.	Univ. of Michigan	2,877	2,728	1.9
5.	Cornell Univ.	2,312	2,585	11.8
6.	Ohio State Univ.	2,375	2,361	-.6
7.	Texas A&M Univ.	2,012	2,072	3.0
8.	Univ. of Illinois - Urbana	2,074	2,046	-1.3
9.	Massachusetts Inst. of Tech.	1,968	2,032	1.8
10.	Johns Hopkins Univ.	1,990	1,991	.1
11.	Univ. of Florida	2,051 I	1,988	-3.1
12.	Louisiana State Univ. System	1,885	1,978	4.9
13.	Univ. of Washington	1,947	1,964	.9
14.	Pennsylvania State Univ.	1,873	1,903	1.6
15.	Univ. of Texas at Austin	1,670	1,680	.6
16.	Purdue Univ. - All campuses	1,581	1,626	2.9
17.	Yale Univ.	1,561	1,601	2.6
18.	Michigan State Univ.	1,575	1,601	1.7
19.	Univ. of Pittsburgh	1,552	1,559 I	3.0
20.	Stanford Univ.	1,493	1,584	6.1

NOTE: I indicates that data were imputed for nonresponse.

SOURCE: National Science Foundation.

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Detailed Statistical Tables. Human Resources for Scientific Activities at Universities and Colleges, January 1978 (NSF 78-318) was published in January 1979 and can be obtained from the Division of Science Resources Studies, National Science Foundation, Washington, D.C. 20550. For information on the availability of data tapes, please call Moshman Associates, Inc., at 301-229-3000.

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